**Topics 02 - Atomic Structure (SL/HL 1)**

**Topic 02: Atomic structure (4 hours)**   
**2.1 The atom - 1 hour**   
2.1.1 State the position of protons, neutrons and electrons in the atom. (1)   
2.1.2 State the relative masses and relative charges of protons, neutrons and electrons. (1)   
2.1.3 Define the terms mass number (A), atomic number (Z) and isotopes of an element. (1)   
2.1.4 Deduce the symbol for an isotope given its mass number and atomic number. (3)   
2.1.5 Calculate the number of protons, neutrons and electrons in atoms and ions from the mass number, atomic number and charge. (2)   
2.1.6 Compare the properties of the isotopes of an element. (3)   
2.1.7 Discuss the uses of radioisotopes. (3)   
  
**2.2 The mass spectrometer - 1 hour**   
2.2.1 Describe and explain the operation of a mass spectrometer. (3)   
2.2.2 Describe how the mass spectrometer may be used to determine relative atomic mass using the 12C scale. (2)   
2.2.3 Calculate non-integer relative atomic masses and abundance of isotopes from given data. (2)   
  
**2.3 Electron arrangement - 2 hours**   
2.3.1 Describe the electromagnetic spectrum. (2)   
2.3.2 Distinguish between a continuous spectrum and a line spectrum. (2)   
2.3.3 Explain how the lines in the emission spectrum of hydrogen are related to electron energy levels. (3)   
2.3.4 Deduce the electron arrangement for atoms and ions up to Z = 20. (3)   
  
  
**Topic 12: Atomic structure (3 hours)**   
**12.1 Electron configuration - 3 hours**   
12.1.1 Explain how evidence from first ionization energies across periods accounts for the existence of main energy levels and sub-levels in atoms. (3)   
12.1.2 Explain how successive ionization energy data is related to the electron configuration of an atom. (3)   
12.1.3 State the relative energies of s, p, d and f orbitals in a single energy level. (1)   
12.1.4 State the maximum number of orbitals in a given energy level. (1)   
12.1.5 Draw the shape of an s orbital and the shapes of the px, py and pz orbitals. (1)   
12.1.6 Apply the Aufbau principle, Hund’s rule and the Pauli exclusion principle to write electron configurations for atoms and ions up to Z = 54. (2)